

CLAIMS

What is claimed is:

1. An infrared imaging optical system comprising:
 - a front lens group having negative optical power, wherein the front lens group comprises a front lens having a refractive index of from about 2.0 to about 3.0;
 - 5 an intermediate lens group that receives an infrared light beam from the front lens group, wherein the intermediate lens group comprises an intermediate lens;
 - a rear lens group having positive optical power, wherein the rear lens group receives the infrared light beam from the intermediate lens group, and
 - 10 wherein the rear lens group comprises a rear lens having a refractive index of from about 2.0 to about 3.0; and
 - an infrared detector that receives the infrared light beam from the rear lens group, wherein
 - the imaging optical system has a pupil located between the rear lens group and the
 - 15 detector.
2. The infrared imaging optical system of claim 1, wherein at least two of the front lens, the intermediate lens, and the rear lens have at least one aspheric surface thereon.
3. The infrared imaging optical system of claim 1, wherein the lenses with a refractive index of from about 2.0 to about 3.0 are made of a material selected from the group consisting of zinc sulfide, zinc selenide, arsenic trisulfide, and antir1.
4. The infrared imaging optical system of claim 1, wherein the intermediate lens group comprises an intermediate lens having a refractive index of from about 1.35 to about 2.0.

5. The infrared imaging optical system of claim 4, wherein the lens with a refractive index of from about 1.35 to about 2.0 is made of a material selected from the group consisting of sapphire, spinel, barium fluoride, calcium fluoride, magnesium fluoride, and magnesium oxide.

6. The infrared imaging optical system of claim 1, wherein the intermediate lens group comprises an intermediate lens having a refractive index of from about 1.35 to about 1.7.

7. The infrared imaging optical system of claim 1, wherein the front lens has a refractive index of from about 2.2 to about 2.6.

8. The infrared imaging optical system of claim 1, wherein the rear lens has a refractive index of from about 2.2 to about 2.6.

9. The infrared imaging optical system of claim 1, wherein the detector is operable in a 3-5 micrometer wavelength range.

10. The infrared imaging optical system of claim 1, further including a cold shield around the detector and having an opening therein at the pupil.

11. An infrared imaging optical system comprising:
a front lens group having negative optical power, wherein the front lens group comprises a front lens;

an intermediate lens group that receives an infrared light beam from the front lens group, wherein the intermediate lens group comprises an intermediate lens;

a rear lens group having positive optical power, wherein the rear lens group receives the infrared light beam from the intermediate lens group, wherein the rear lens group comprises a rear lens, and wherein at least two of the front lens, the intermediate lens, and the rear lens have at least one aspheric surface

thereon; and

an infrared detector that receives the infrared light beam from the rear lens group,

wherein the imaging optical system has a pupil located between the rear lens group and the detector.

12. The infrared imaging optical system of claim 11, wherein the front lens has a refractive index of from about 2.0 to about 3.0.

13. The infrared imaging optical system of claim 11, wherein the intermediate lens has a refractive index of from about 1.35 to about 2.0.

14. The infrared imaging optical system of claim 11, wherein the rear lens has a refractive index of from about 2.0 to about 3.0.

15. The infrared imaging optical system of claim 11, wherein the detector is operable in a 2-7 micrometer wavelength range.

16. The infrared imaging optical system of claim 11, further including a cold shield around the detector and having an opening therein at the pupil.

17. An infrared imaging optical system comprising:
a front lens group having negative optical power, wherein the front lens group comprises a front lens having a refractive index of from about 2.2 to about 2.6;

5 an intermediate lens group that receives an infrared light beam from the front lens group, wherein the intermediate lens group comprises an intermediate lens having a refractive index of from about 1.35 to about 1.7;

a rear lens group having positive optical power that receives the infrared light beam from the intermediate lens group, wherein the rear lens group
10 comprises a rear lens having a refractive index of from about 2.2 to about 2.6, and

wherein at least two of the front lens, the intermediate lens, and the rear lens have at least one aspheric surface thereon; and

an infrared detector that receives the infrared light beam from the rear lens group,

- 15 wherein the imaging optical system has a pupil located between the rear lens group and the detector.

18. The infrared imaging optical system of claim 17, wherein the lenses with a refractive index of from about 2.2 to about 2.6 are made of a material selected from the group consisting of zinc sulfide, zinc selenide, arsenic trisulfide, and antir1.

19. The infrared imaging optical system of claim 17, wherein the lenses with a refractive index of from about 1.35 to about 2.0 are made of a material selected from the group consisting of sapphire, spinel, barium fluoride, calcium fluoride, magnesium fluoride, and magnesium oxide.

20. The infrared imaging optical system of claim 17, wherein the detector is operable in a 2-7 micrometer wavelength range.

21. The infrared imaging optical system of claim 17, further including a cold shield around the detector and having an opening therein at the pupil.